

**GROUND WATER DISCHARGE PERMIT UGW270004**  
**STATEMENT OF BASIS**

Intermountain Power Service Corporation  
Intermountain Generating Station  
Millard County, Utah

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This Statement of Basis describes the facilities, hydrogeology, ground water quality, basis of permit issuance and specific conditions, and corrective actions for Ground Water Discharge Permit UGW270004 for the Intermountain Generating Station.

**Facility Description**

Intermountain Power Service Corporation (IPSC) operates the Intermountain Generating Station (IGS) in Millard County, Utah. IGS is a coal fired power plant with integrated transmission facilities. IGS was built in the early 1980s and placed on-line in 1986. IGS has an electrical output capacity of 1900 megawatts. The expected life of the station at time of design was 35 years. This station was in operation prior to the 1989 promulgation of the Utah Ground Water Quality Protection Rules (UAC R317-6) and is thus defined as an “existing facility”.

IGS is situated on 4614.78 acres located 10 miles northeast of Delta, Utah. This station is located in portions of Section 18 and 19, T15S, R6W, and portions of Sections 10, 11, 12, 13, 14, 15, 22, 23, and 24, T15S, R7W, Salt Lake Meridian, Utah.

Extensive geotechnical studies of the site were conducted between 1978 and 1983, prior to designing and building the power plant and support facilities. These investigations were incorporated into the siting and construction of the process water and ground water monitoring system.

IGS does not discharge any process water effluent or leachate directly onto the ground surface or into the subsurface. IGS uses a series of 13 ponds in a four-tiered system to settle, clarify, recirculate, and evaporate process waters. Tier 1, the best quality, is the Settling Basin. The water quality degrades progressively as it moves to Tier 2 (Bottom Ash Ponds), Tier 3 (Wastewater basin), and Tier 4 (Evaporation Ponds), respectively. Water in the evaporation ponds is unusable due to high levels of alkalinity, salinity, and mineralization (calcium and magnesium). Other than the makeup water storage ponds, the IGS ponds hold water that is not compatible with the ground water due to elevated concentrations of total dissolved solids (TDS). The Bottom Ash, Wastewater, and Evaporation ponds are lined with a single layer of 80-mil high density polyethylene (HDPE). The Settling Basin and Coal Pile Runoff Basin are lined with a bentonite clay-natural soil mixture.

The following IGS facilities are permitted by rule in accordance with UAC R317-6-6.2:

- Onsite reservoir,
- Storm water runoff basin,
- Storm water runoff ditch,
- Fly ash landfill,
- Solid waste landfill,
- Aboveground and underground storage tanks,
- Pipelines that do not transport process water to facility ponds,
- Septic tanks, and
- Lawn irrigation.

## **Hydrogeology**

The IGS site is located over an unconsolidated basin-fill aquifer in the Sevier Desert, a large intermontane valley in the Basin and Range Physiographic Province. This area was once covered by ancient Lake Bonneville, and complex series of Tertiary and Quaternary age sediments were deposited as a result of historic changes in water level. The near surface deposits at the site consist of sands, silts, and clays of aeolian, fluvial, and lacustrine origin. Surface sediments consist primarily of granular soils and extend to depths ranging from 7 to 35 feet below the existing ground surface. Loose, near surface soils consist primarily of silty sands and sandy silts, but may also contain clean sands and clays. These soils, typically encountered in the upper 2 to 4 feet of the subsurface profile, have a porous structure, relatively low densities, and contain some organic material. Soils below depths of 2 to 4 feet are primarily medium dense to very dense fine sands. Interbedded with the sands are layers of very stiff to hard silty clays and silts. It appears that a continuous fine-grained low-permeability interval, which contains few sand lenses, is present beneath facilities monitored in this permit. The ground water surface is typically below this low-permeability clay layer.

The saturated sediments underlying the IGS site represent a multiple aquifer system. The sediments are zoned into three coarse-grained, permeable aquifers: 1) a shallow water table aquifer, 2) an upper confined aquifer, and 3) a lower confined aquifer. All three zones are separated by laterally extensive clay layers that act as aquitards. The lower confined aquifer is used as a culinary water supply source for the general area. Recharge to the valley-fill sediments occurs primarily by infiltration of snow melt, surface runoff, and direct precipitation. Ground water recharge to the IGS site is predominantly from the North Tintic and Tintic Mountains to the northeast. Ground water discharge is principally through evapo-transpiration, interbasin flow, and ground water pumpage by wells.

The shallow unconfined water table aquifer is composed of layered sand, silt, and clay. All units below the water table are saturated. Hydraulic conductivities for all of the aquifers are similar, and range from  $1.9 \times 10^{-5}$  cm/sec for the silty sands to  $9.6 \times 10^{-9}$  cm/sec for clay. Based on a monitoring well network, ground water flow direction is westerly. An upward vertical hydraulic gradient exists between the aquifers.

## **Ground Water Quality**

In general, ground water quality within the Sevier Desert is poor except in the Delta area and is too saline for agricultural purposes without special treatment. Ground water from the unconfined aquifer is predominantly a magnesium sulfide type and has elevated concentrations of sodium, potassium, carbonate or bicarbonate, sulfate, and chloride. Barium and iron are the main trace metals, but chromium, manganese, arsenic, lead, and zinc are also present. Ground water quality data have been collected since 1982 from IGS monitoring wells. Background ground water quality is based on historical data prior to original permit issuance and subsequent compliance data collected as a permit requirement from the monitoring wells screened in site aquifers. Ground water quality in the unconfined aquifer is generally Class II with TDS in the upgradient unconfined aquifer ranging from 750 mg/l to over 1,100 mg/l. TDS has been demonstrated to be variable across the 4,614-acre site. Chlorides are typically near or exceeding the secondary drinking water standard of 250 mg/l. Water quality data collected for the IGS station indicate that the elevated arsenic levels are naturally occurring, and upgradient monitoring wells have demonstrated a range of variability in arsenic concentrations. In several wells, the background concentration for arsenic exceeds the ground water quality standard of 0.05 mg/l. Arsenic is not a component of process waters and ground water will not be monitored for arsenic. Detections of cadmium, lead and mercury have occasionally exceeded the Class II protection levels.

## **Basis of Permit Issuance**

The determination of impacts from present day releases to ground water is a major concern in ground water management. IPSC has proposed a zero discharge approach by using containment technology with a monitoring component to assess potential impacts to ground water quality from the operation of the IGS. This permit will incorporate lined ponds, ground water monitoring wells, perched monitoring wells, and Best Management Practices as the compliance mechanisms. Existing ponds, basins, sumps, and reservoirs were not constructed with direct leak detection and removal mechanisms such as double liners and sump pumps.

The administration of the permit, to assure compliance with ground water protection regulations, is founded on the use of periodic monitoring ground water quality in wells to assess potential impacts to ground water quality from the IGS discharges. IGS will monitor compliance wells located adjacent to and downgradient (west) of the lined ponds and permitted facilities. These ground water monitoring wells are completed in the unconfined aquifer (IGS Type II wells). Compliance limits for the wells were established from background data collected and analyzed by IPSC over the life of the design, construction, and operation of the IGS station.

## **Basis for Specific Permit Conditions**

### Upgradient Monitoring Wells

Ground water quality data from two upgradient monitoring wells will be used as a comparison standard for all other monitoring and observation wells on the site. Based on their extensive sampling history, these wells will be sampled once every 5 years prior to permit renewal.

### Evaporation Ponds, Bottom Ash Basins, Wastewater Holding Basin, and Settling Basins

Monitoring wells completed in the unconfined water table aquifer on the downgradient (west) side of the permitted facilities will be used as a compliance mechanism for this permit. A long history of regular monitoring has established the background water quality from project design through construction and operation. The monitoring well data will assess use of overall best management practices at the IGS site to determine if ground water quality parameters are stable and not degrading over time. Table 1A of the permit lists the compliance monitoring wells and numeric permit limits. The minimum frequency of monitoring, sampling, and reporting will be semi-annually.

### Perched Wells

Because the perched wells are normally dry, they are, by design, primary indicators of leakage through the pond liner. The perched wells listed in Table 1B will also be used as a compliance mechanism of this permit. Water level measurements in the perched wells will be made according to the schedule in Table 1B. The Sampling and Contingency Plan will incorporate the procedures for using perched wells for process water leak detection.

## **Corrective Actions**

Ground water investigations completed during the previous permit term indicated that one of the Bottom Ash Basins has leaked Tier II process water into the shallow aquifer. IPSC has implemented corrective actions and installed three ground water extraction wells to remove ground water with elevated TDS concentrations from the shallow aquifer and to contain plume movement. This water is pumped to the Recycle Basin for reuse in the process water system. Other monitoring wells installed for the investigations have been used to delineate the area of elevated TDS. The area is generally southwest of the Bottom Ash Basins and follows the natural westward hydraulic gradient. The areal extent of the plume is contained within the facility boundaries. IPSC has revised the Sampling and Contingency Plan (Appendix A) for monitoring plume size and movement.

Should future data indicate that additional clean up is needed, the permit has a compliance condition that allows the Executive Secretary to call for a Contamination Investigation and Corrective Action Plan to be submitted and made a part of this permit.